How to Buy Energy-Efficient Fluorescent Tube Lamps

Energy Efficiency and Renewable Energy
Federal Energy Management Program

Why Agencies Should Buy Efficient Products

- *Section 161 of the Energy Policy Act of 1992 (EPACT) encourages energy-efficient federal procurement. Executive Order 12902 and FAR section 23.704 direct agencies to purchase products in the upper 25% of energy efficiency.*
- *Agencies that use these guidelines to buy efficient products can realize substantial operating cost savings and help prevent pollution.*
- *As the world's largest consumer, the federal government can help "pull" the entire U.S. market towards greater energy efficiency, while saving taxpayer dollars.*

Federal Supply Sources:

- Defense Logistics Agency (DLA)
  Phone: (800) DLA-BULB
- General Services Administration (GSA)
  Phone: (817) 978-8632 (Vicki Moore)
  http://www.fss.gsa.gov

For More Information:

- DOE's Federal Energy Management Program (FEMP) Help Desk and World Wide Web site have up-to-date information on energy-efficient federal procurement, including the latest versions of these recommendations.
  Phone: (800) 363-3732
  http://www.eren.doe.gov/femp/procurement
- FEMP's *Federal Lighting Guide* provides helpful guidance on lighting projects.
  Phone: (800) 363-3732
  http://www.eren.doe.gov/femp
- American Council for an Energy-Efficient Economy (ACEEE) publishes the *Guide to Energy-Efficient Commercial Equipment*, which includes a chapter on lighting.
  Phone: (202) 429-0063
  http://aceee.org
- Lighting Research Center's Web site has valuable information covering various lighting systems.
  Phone: (518) 276-8716
  http://www.lrc.rpi.edu
- E SOURCE publishes *Lighting Technology Atlas* (available to member organizations).
  Phone: (303) 440-8500
  http://www.esource.com
- Lawrence Berkeley National Laboratory provided supporting analysis for this recommendation.
  Phone: (202) 484-0880

Efficiency Recommendation

Lamp Type	Recommended	Best Available
Four-Foot Lamps		
T8, 32 watts	2800 lumens or more	3000 lumens
T12, 34 watts	2800 lumens or more	2900 lumens
Eight-Foot Lamps		
T8, 59 watts	5700 lumens or more	5950 lumens
T12, 60 watts	5600 lumens or more	6000 lumens
U-Tube Lamps		
T8/U, 31-32 watts	2600 lumens or more	2850 lumens
T12/U, 34 watts	2700 lumens or more	2760 lumens

Definition

Lumen is a measure of light output.

Where to Find Energy-Efficient Fluorescent Tube Lamps

The federal supply sources for energy-efficient fluorescent lamps are the Defense Logistics Agency (DLA) and the General Services Administration (GSA). DLA sells fluorescent tubes through its *Energy Efficient Lighting* catalog. GSA offers them on Schedule 62-II, as well as through its on-line shopping network, *GSA Advantage!* Choose lamps that meet the recommended levels.

When contracting or buying from a commercial source, specify or select a lamp lumen rating that meets the Efficiency Recommendation for that lamp type and wattage.

Buyer Tips

Lamps and ballasts should be upgraded together to insure compatibility and energy savings (see "How to Buy Energy-Efficient Fluorescent Ballasts"). Full-wattage T12 lamps (four-foot T12, 40 watt lamps or eight-foot T12, 75 watt lamps) are not recommended for most applications. Four-foot T8, 32 watt lamps are preferred over four-foot T12, 34 watt ("reduced wattage") lamps to take advantage of a wider selection of efficient ballast models. Reduced wattage T12 lamps are unsuitable for low-temperature applications due to starting difficulties in cold conditions.

Fluorescent lamps should have a color rendering index (CRI) of at least 70 for most commercial applications. "Rare-earth phosphor" fluorescent lamps usually have high CRIs and meet the levels of this Efficiency Recommendation; many efficient lamps with other phosphor types have CRIs below 70.

Due to their mercury content, most spent fluorescent tube lamps are classified as hazardous waste in most states under the Resource Conservation and Recovery Act (RCRA). However, some models are manufactured with a low enough mercury content (under about 10 micrograms per lamp) to be exempted from this hazardous classification. Also, many companies offer lamp recycling services.

Definitions

Color Rendering Index (CRI) measures the quality of color rendition compared with a reference light source of comparable color temperature. CRI has a maximum of 100.

Fluorescent Tube Lamp Cost-Effectiveness Example

Performance	Base Model	Recommended Level	Best Available
Lamp and Ballast Type	T12, 34 watts, magnetic ballast	T8, 32 watts, electronic ballast	T8, 32 watts, electronic ballast
Rated Lamp Output – 2 Lamps	5300 lumens	5600 lumens	6000 lumens
Actual Light Output, with Ballast[a]	4738 lumens	5018 lumens	5256 lumens
Input Power	82 watts	62 watts	57 watts
Annual Energy Usage	295 kWh	223 kWh	205 kWh
Annual Energy Cost	$17.70	$13.40	$12.30
Annual Energy Cost Savings – 2 Lamps + Ballast	–	$4.30	$5.40
Annual Energy Cost Savings – 2 Lamps only	–	$1.30	$1.80
Lifetime Energy Cost Savings – per Lamp	–	**$2.80**	**$3.90**

a) Not including fixture performance, which affects total light output from the luminaire.

Lifetime Energy Cost Savings is the sum of the discounted value of annual energy cost savings based on average usage and an assumed lamp life of 5 years. Future electricity price trends and a discount rate of 4.1% are based on federal guidelines (effective from April, 1998 to March, 1999).

Cost-Effectiveness Assumptions

Energy use and performance of a fluorescent lamp depends on the performance of the ballast(s) and the fixture which, together with the lamps, make up a luminaire. This example examines the cost-effectiveness of choosing energy efficient fluorescent lamps and ballasts. The example also shows the Lifetime Energy Cost Savings for improved lamps alone, net of the savings from improved ballasts. Each case evaluates energy use by two lamps matched with an appropriate two-lamp ballast, selected to provide a similar level of light output.

Annual energy use is based on 3,600 operating hours/year. Lifetime energy costs and savings are based on a 5-year lamp life. The assumed electricity price is 6¢/kWh, the 1996 federal average electricity price in the U.S.

Using the Cost-Effectiveness Table

In the example above, a lamp at the Recommended Level is cost-effective if its purchase price does not exceed the price of a Base Model lamp by more than $2.80. Similarly, the Best Available lamp is cost-effective if its price is no more than $3.90 above the price of a Base Model lamp.

Metric Conversion

1 foot = 30.5 cm

What if my Electricity Price or Hours of Use are different?

To calculate annual or lifetime savings for a different electricity price, multiply the savings in the above table by this ratio: $\left(\frac{\textit{Your price in ¢/kWh}}{\textit{6.0 ¢/kWh}}\right)$. Similarly, for different hours of use, multiply savings by this ratio: $\left(\frac{\textit{Your yearly hours of use}}{\textit{3,600}}\right)$.

FEMP
FEDERAL ENERGY MANAGEMENT PROGRAM